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DEFENSE COMMUNICATIONS AGENCY

UPPER LEVEL PROTOCOL TEST SYSTEM

INSTALLATION AND OPERATIONS MANUAL

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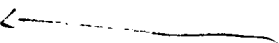
SECTION 1 - INTRODUCTION

This manual provides the guidelines for the installation and maintenance of the DCA Upper Level Protocol Test System for the standard high-level protocols (IP, IPSO, TCP, TCP-IP, FTP, SMTP and Telnet).

The protocol test system is made up of six subsystems:

- o ULTRIX (Unix BSD4.2) Operating System Test Kernel (Test System UNIX)
- o Laboratory Slave Drivers
- o Test Scenarios and required auxiliary files
- o Laboratory Test Reference Implementations
- o Report Generator
- o Man-Machine Interface

These subsystems are organized under two directories. The Test Kernel is in directory **NETTEST** and the other subsystems are in subdirectories of the directory **tsl**.

Section 2 of this manual describes the Protocol Test Reference UNIX (TRU). Section 3 describes the **tsl** directory structure and provides a reference guide to the required files in each directory. Section 4 details the environment and directory structure provided each testing client. Section 5 contains the installation instructions for the DCA Upper Level Protocol Test System and Section 6 details the steps required to build a client testing environment. 

SECTION 2 - THE PROTOCOL TEST REFERENCE UNIX (TRU)

The TRU kernel is a modified Ultrix Kernel. Installation of the TRU kernel requires replacing some files from the standard Ultrix V1.1 distribution with new versions of these files, adding a few others, and rebuilding the modified Ultrix Kernel. See Appendix A for the added or modified file list. These replacement files are provided to the System Administrator as object (*.o) files and are all involved in Ultrix's networking code.

The DCA Upper Level Protocol Test System kernel includes all the functions of the standard kernel. You may run normal UNIX 4.2 applications transparently when the TRU kernel is running.

SECTION 3 - PROTOCOL TEST SYSTEM COMPONENTS

The **tsl** directory structure is shown in Figure 3-1. All of the protocol test system except for the Test Reference UNIX (TRU) kernel code is found under the **tsl** directory.

Table 3-1 is a list and a description of the files in the **tsl** tree.

Table 3-1 - TSL FILES (1 of 15)

<u>Path and File Name</u>	<u>Description</u>
tsl	
Make-bld-iut	Shell to set up client directories.
Make-rm-dir	Shell to delete client directories (called by Make-bld-iut).
Make-bld-set	Shell to build client test and rslt directories (called by Make-bld-iut).
Make-ch-one	Shell to set permissions in client directories (called by Make-bld-iut).
Make-ln-soft	Shell to set up links from client directories to tsl files (called by Make-bld-iut).
/drivers	
/tcp/lab/bin	
tcp_lab_driver	tcp and tcp-ip driver - listens on port 2002
/smtp/lab/bin	
smtp_lab_driver	smtp driver and receiver reference driver listens on port 1030 smtp receiver listens on port 1051
/ftp/lab/bin	
ftp_server_driver	ftp server driver - listens on port 1201
ftp_user_driver	ftp user driver - listens on port 1204, port 1203, and port 1202
ftp_3way_server_driver	ftp server driver - listens on port 1205

Table 3-1 - TSL FILES (2 of 15)

<u>Path and File Name</u>	<u>Description</u>
tsl	
/drivers	
/telnet/lab/bin	
telnet_server_driver	telnet server driver - listens on port 1203
telnet_user_driver	telnet user driver - listens on port 1202
/ipso/lab/bin	
ipso_lab_driver	ip security test driver - listens on port 2022
/ip/lab/bin	
ip_lab_driver	ip driver - listens on port 4000
/ref	
/telnet/bin	
telnet	user telnet reference
tnd	server telnet reference - listens on port 1211
/ftp/bin	
ftpd	server ftp reference - listens on port 1210
ftp3d	server ftp reference - listens on port 1209
uftp	user ftp reference
tsl	
/test	
/ip/bin	
IP_BASIC	ip scenario
IP_FRAGMENTS	ip scenario

Table 3-1 - TSL FILES (3 of 15)

<u>Path and File Name</u>	<u>Description</u>
tsl	
/test	
/ip/bin	
IP_EXTEND	ip scenario
IP_NOP	ip scenario
IP_STREAMOPT	ip scenario
IP_TIMESTAMP1	ip scenario
IP_TIMESTAMP2	ip scenario
IP_RECROUTE	ip scenario
IP_STRICTSR	ip scenario
IP_LOOSESER	ip scenario
IP_OPTIONS	ip scenario
IP_ICMP	ip scenario
TOPDOWN_BASIC1	ip scenario
TOPDOWN_BASIC2	ip scenario
TOPDOWN_NOP	ip scenario
TOPDOWN_RECROUTE	ip scenario
TOPDOWN_STREAMOPT	ip scenario
TOPDOWN_STRICTSR	ip scenario
TOPDOWN_LOOSESER	ip scenario
TOPDOWN_TIMESTAMP	ip scenario
TOPDOWN_OPTIONS	ip scenario
/ip/aux	
test.ndx	Description of ip tests required for Report Generator
scenario.ndx	Description of ip scenarios required for Man-Machine-Interface(MMI)
input_fields	Ordered list of input fields required by scenarios
templatel	Scenario input template required for MMI

Table 3-1 - TSL FILES (4 of 15)

<u>Path and File Name</u>	<u>Description</u>
tsl	
/test	
/ip/aux	
IP_BASIC.toc	Description of tests in scenario
IP_FRAGMENTS.toc	Description of tests in scenario
IP_EXTEND.toc	Description of tests in scenario
IP_NOP.toc	Description of tests in scenario
IP_STREAMOPT.toc	Description of tests in scenario
IP_TIMESTAMP1.toc	Description of tests in scenario
IP_TIMESTAMP2.toc	Description of tests in scenario
IP_RECROUTE.toc	Description of tests in scenario
IP_STRICTSR.toc	Description of tests in scenario
IP_LOOSESR.toc	Description of tests in scenario
IP_OPTIONS.toc	Description of tests in scenario
IP_ICMP.toc	Description of tests in scenario
TOPDOWN_BASIC1.toc	Description of tests in scenario
TOPDOWN_BASIC2.toc	Description of tests in scenario
TOPDOWN_NOP.toc	Description of tests in scenario
TOPDOWN_RECROUTE.toc	Description of tests in scenario
TOPDOWN_STREAMOPT.toc	Description of tests in scenario
TOPDOWN_STRICTSR.toc	Description of tests in scenario
TOPDOWN_LOOSESR.toc	Description of tests in scenario
TOPDOWN_TIMESTAMP.toc	Description of tests in scenario
TOPDOWN_OPTIONS.toc	Description of tests in scenario
/tcp/bin	
ALLOC	tcp scenario
BASIC	tcp scenario
CLOSE	tcp scenario
MULTIPLEX	tcp scenario
OPEN	tcp scenario
OUT_OF_BAND	tcp scenario

Table 3-1 - TSL FILES (5 of 15)

<u>Path and File Name</u>	<u>Description</u>
tsl	
/test	
/tcp/bin	
POLICY	tcp scenario
QUAL	tcp scenario
RELIABILITY	tcp scenario
RESET	tcp scenario
SECURITY	tcp scenario
/tcp/aux	
test.ndx	Description of tcp tests required for Report Generator
scenario.ndx	Description of tcp scenarios required for Man-Machine-Interface(MMI)
input_fields	Ordered list of input fields required by scenarios
templatel	Scenario input template required for MMI
template2	Scenario input template required for MMI
ALLOC.toc	Description of tests in scenario
BASIC.toc	Description of tests in scenario
CLOSE.toc	Description of tests in scenario
MULTIPLEX.toc	Description of tests in scenario
OPEN.toc	Description of tests in scenario
OUT_OF_BAND.toc	Description of tests in scenario
POLICY.toc	Description of tests in scenario
QUAL.toc	Description of tests in scenario
RELIABILITY.toc	Description of tests in scenario
RESET.toc	Description of tests in scenario
SECURITY.toc	Description of tests in scenario

Table 3-1 - TSL FILES (6 of 15)

<u>Path and File Name</u>	<u>Description</u>
tsl	
/test	
/tcp-ip/bin	
IP_BASIC	ip scenario
FRAGMENTS	ip scenario
ICMP	ip scenario
BASIC	tcp scenario
EXTENDIP	ip scenario
OPEN	tcp scenario
CLOSE	tcp scenario
RELIABILITY	tcp scenario
MULTIPLEX	tcp scenario
SECURITY	tcp scenario
ALLOC	tcp scenario
POLICY	tcp scenario
OUT_OF_BAND	tcp scenario
RESET	tcp scenario
QUAL	tcp scenario
 /tcp-ip/aux	
test.ndx	Description of tcp-ip tests required for Report Generator
scenario.ndx	Description of tcp-ip scenarios required for Man-Machine-Interface(MMI)
input_fields	Ordered list of input fields required by scenarios
templatel	Scenario input template required for MMI
template2	Scenario input template required for MMI

Table 3-1 - TSL FILES (7 of 15)

<u>Path and File Name</u>	<u>Description</u>
tsl	
/test	
/tcp-ip/aux	
IP_BASIC.toc	Description of tests in scenario
FRAGMENTS.toc	Description of tests in scenario
ICMP.toc	Description of tests in scenario
BASIC.toc	Description of tests in scenario
EXTENDIP.toc	Description of tests in scenario
OPEN.toc	Description of tests in scenario
CLOSE.toc	Description of tests in scenario
RELIABILITY.toc	Description of tests in scenario
MULTIPLEX.toc	Description of tests in scenario
SECURITY.toc	Description of tests in scenario
ALLOC.toc	Description of tests in scenario
POLICY.toc	Description of tests in scenario
OUT_OF_BAND.toc	Description of tests in scenario
RESET.toc	Description of tests in scenario
QUAL.toc	Description of tests in scenario
/telnet-user/bin	
USER_BASIC	scenario to test user telnet
USER_OPTIONS1	scenario to test user telnet
USER_OPTIONS2	scenario to test user telnet
USER_SYNCH	scenario to test user telnet
/telnet-user/aux	
test.ndx	Description of telnet tests required for Report Generator
scenario.ndx	Description of telnet scenarios required for Man-Machine-Interface
input_fields	Ordered list of input fields required by scenarios

Table 3-1 - TSL FILES (8 of 15)

<u>Path and File Name</u>	<u>Description</u>
tsl	
/test	
/telnet-user/aux	
templatel	Scenario input template required for Man-Machine-Interface
input_fields	Ordered list of input fields required by scenarios
templatel	Scenario input template required for Man-Machine-Interface
USER_BASIC.toc	Description of tests in scenario
USER_OPTIONS1.toc	Description of tests in scenario
USER_OPTIONS2.toc	Description of tests in scenario
USER_SYNCH.toc	Description of tests in scenario
/telnet-server/bin	
SERVER_BASIC	scenario to test server telnet
SERVER_OPTIONS1	scenario to test server telnet
SERVER_OPTIONS2	scenario to test server telnet
SERVER_SYNCH	scenario to test server telnet
/telnet-server/aux	
test.ndx	Description of telnet tests required for Report Generator
scenario.ndx	Description of telnet scenarios required for Man-Machine-Interface
input_fields	Ordered list of input fields required by scenarios
templatel	Scenario input template required for Man-Machine-Interface
SERVER_BASIC.toc	Description of tests in scenario
SERVER_OPTIONS1.toc	Description of tests in scenario
SERVER_OPTIONS2.toc	Description of tests in scenario
SERVER_SYNCH.toc	Description of tests in scenario

Table 3-1 - TSL FILES (9 of 15)

<u>Path and File Name</u>	<u>Description</u>
tsl	
/test	
/ftp-user/bin	
FILE_XFER	scenario to test user ftp
BASIC	scenario to test user ftp
CONN_SERVICE	scenario to test user ftp
FILE_SERVICE	scenario to test user ftp
THREE_WAY	scenario to test user ftp
/ftp-user/aux	
test.ndx	Description of ftp tests required for Report Generator
scenario.ndx	Description of ftp scenarios required for Man-Machine-Interface
input_fields	Ordered list of input fields required by scenarios.
templatel	Scenario input template required for Man-Machine-Interface
FILE_XFER.toc	Description of tests in scenario
BASIC.toc	Description of tests in scenario
CONN_SERVICE.toc	Description of tests in scenario
FILE_SERVICE.toc	Description of tests in scenario
THREE_WAY.toc	Description of tests in scenario
/ftp-server/bin	
BASIC	scenario to test server ftp
FILE_SERVICE	scenario to test server ftp
CONN_SERVICE	scenario to test server ftp
FILE_XFER	scenario to test server ftp
NO_LOGIN	scenario to test server ftp

Table 3-1 - TSL FILES (10 of 15)

<u>Path and File Name</u>	<u>Description</u>
tsl	
/test	
/ftp-server/bin	
GEN_ERROR	scenario to test server ftp
C_CONN_SERVICE	scenario to test server ftp
C_FILE_SERVICE	scenario to test server ftp
C_FILE_XFER	scenario to test server ftp
C_MULTICONN	scenario to test server ftp
THREE_WAY	scenario to test server ftp
/ftp-server/aux	
test.ndx	Description of ftp tests required for Report Generator
scenario.ndx	Description of ftp scenarios required for Man-Machine-Interface(MMI)
input_fields	Ordered list of input fields required by scenarios.
templatel	Scenario input template required for MMI
BASIC.toc	Description of tests in scenario
FILE_SERVICE.toc	Description of tests in scenario
CONN_SERVICE.toc	Description of tests in scenario
FILE_XFER.toc	Description of tests in scenario
NO_LOGIN.toc	Description of tests in scenario
C_CONN_SERVICE.toc	Description of tests in scenario
C_FILE_SERVICE.toc	Description of tests in scenario
C_FILE_XFER.toc	Description of tests in scenario
C_MULTICONN.toc	Description of tests in scenario
THREWAY.toc	Description of tests in scenario

Table 3-1 - TSL FILES (11 of 15)

<u>Path and File Name</u>	<u>Description</u>
tsl	
/test	
/smtp-sender/bin	
BASIC	scenario to test sender smtp
SOML	scenario to test sender smtp
SAML	scenario to test sender smtp
SEND	scenario to test sender smtp
ASCII	scenario to test sender smtp
SYNTAXBAD	scenario to test sender smtp
REPLYBAD	scenario to test sender smtp
LONGLINE	scenario to test sender smtp
/smtp-sender/aux	
test.ndx	Description of ftp tests required for Report Generator
scenario.ndx	Description of smtp scenarios required for Man-Machine-Interface(MMI)
input_fields	Ordered list of input fields required by scenarios
templatel	Scenario input template required for MMI
BASIC.toc	Description of tests in scenario
SOML.toc	Description of tests in scenario
SAML.toc	Description of tests in scenario
SEND.toc	Description of tests in scenario
ASCII.toc	Description of tests in scenario
BAD_SYNTAX.toc	Description of tests in scenario
BAD_REPLY.toc	Description of tests in scenario
LONG_LINE.toc	Description of tests in scenario

Table 3-1 - TSL FILES (12 of 15)

<u>Path and File Name</u>	<u>Description</u>
tsl	
/test	
/smtp-receiver/bin	
TRANSACTIONS	scenario to test receiver smtp
MULTI-HELO	scenario to test receiver smtp
BASIC	scenario to test receiver smtp
LIMITS	scenario to test receiver smtp
NEG	scenario to test receiver smtp
RELAY	scenario to test receiver smtp
RELAY3	scenario to test receiver smtp
RSET	scenario to test receiver smtp
RSET_RCPT	scenario to test receiver smtp
RSET_SAML	scenario to test receiver smtp
RSET_SOML	scenario to test receiver smtp
SEND	scenario to test receiver smtp
TURN	scenario to test receiver smtp
OPTIONS	scenario to test receiver smtp
HOSTNAMES	scenario to test receiver smtp
MULTI_RCPT	scenario to test receiver smtp
MULTI_SMTP	scenario to test receiver smtp
/smtp-receiver/aux	
test.ndx	Description of smtp tests required Report Generator
scenario.ndx	Description of smtp scenarios required for Man-Machine-Interface(MMI)
input_fields	Ordered list of input fields required by scenarios
templatel	Scenario input template required for MMI

Table 3-1 - TSL FILES (13 of 15)

<u>Path and File Name</u>	<u>Description</u>
tsl	
/test	
/smtp-receiver/aux	
TRANSACTIONS.toc	Description of tests in scenario
MULTI_HELO.toc	Description of tests in scenario
BASIC.toc	Description of tests in scenario
LIMITS.toc	Description of tests in scenario
NEG.toc	Description of tests in scenario
RELAY.toc	Description of tests in scenario
RELAY3.toc	Description of tests in scenario
RSET.toc	Description of tests in scenario
RSET_RCPT.toc	Description of tests in scenario
RSET_SAML.toc	Description of tests in scenario
RSET_SOML.toc	Description of tests in scenario
SEND.toc	Description of tests in scenario
TURN.toc	Description of tests in scenario
OPTIONS.toc	Description of tests in scenario
HOSTNAMES.toc	Description of tests in scenario
MULTI_RCPT.toc	Description of tests in scenario
MULTI_SMTP.toc	Description of tests in scenario
/ipso/bin	
IPSO	scenario to test IPSO security
/ipso/aux	
test.ndx	Description of ipso tests required for Report Generator
scenario.ndx	Description of ipso scenarios required for Man-Machine-Interface(MMI)
input_fields	Ordered list of input fields required by scenarios

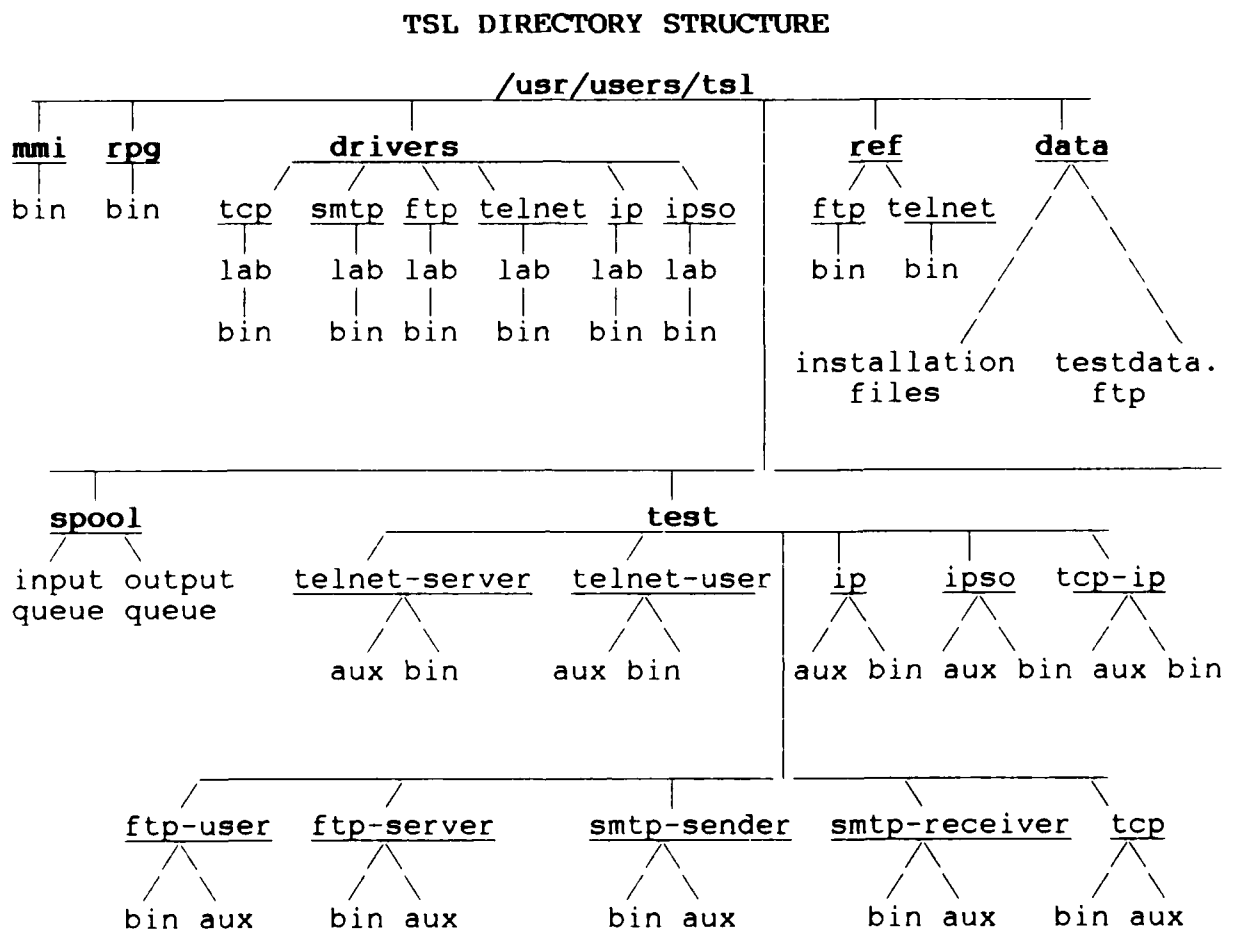
Table 3-1 - TSL FILES (14 of 15)

<u>Path and File Name</u>	<u>Description</u>
tsl	
/test	
/ipso/aux	
templatel	Scenario input template required for MMI
IPSO.toc	Description of tests in scenario
/mmi/bin	
mmi	Man-Machine-Interface (MMI)
help1	MMI help screen
help2	MMI help screen
help3	MMI help screen
help4	MMI help screen
help5	MMI help screen
help6	MMI help screen
help7	MMI help screen
help8	MMI help screen
/rpg/bin	
rpg	Report Generator (RG)
/spool	
/input_queue	Directory required for smtp testing
/output_queue	Directory required for smtp testing
/data	
/testdata.ftp	Directory of data files required for FTP testing
p_file	test data file
test_file	test data file
ref_file1	test data file
ref_file2	test data file

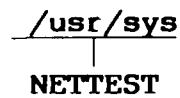
Table 3-1 - TSL FILES (15 of 15)

<u>Path and File Name</u>	<u>Description</u>
tsl	
/data	
/testdata.ftp	
ref_file3	test data file
exist_file	test data file
tran_file1	test data file
/installation_files	Directory of C files required in installing Protocol Test System
add_to_services	File containing additions to the file /etc/services

Figure 3-1 PROTOCOL TEST SYSTEM



DIRECTORY STRUCTURE FOR TEST REFERENCE UNIX



SECTION 4 - THE CLIENT TEST ENVIROMENT

The DCA Upper Level Protocol Test System provides an insulated environment for each client during testing. The system administrator sets up two accounts for each client and all test results are kept in those account directories. Every client is assigned a two letter code which is then prefixed to the strings "test" and "rslt" forming two login names. A group id is also assigned to the accounts. (Section 6 contains the instructions for setting up this test environment.) The .login files of the accounts present them with the Man-Machine Interface (MMI) menu.

The DCA ULP Protocol Test System provides the system administrator with a shellscrip to build the client's home directories and the required test directories in those home directories. Client subdirectories built are:

```

mmi,
rpg and
a directory for each test protocol
    (tcp,tcp-ip,ip,ipso, telnet-user,
    telnet-server, ftp-user, ftp-server
    smtp-sender, smtp-receiver).
```

The mmi and rpg directories are linked to the mmi and rpg directories in the tsl tree. The test protocol directories for the login xxtest have six subdirectories:

```

aux
test
ref
drivers
input
output.
```

The aux, test, ref, and driver subdirectories are linked to their respective directories in the tsl tree. The input and output

directories contain the particular files required and produced for this client. The output directory has further subdirectories for each test execution session where the log and audit trail files for each test are placed.

The xxrslt directory contains an aux and an output subdirectory. The aux directory is linked to its respective aux directory in the the tsl tree. The output directory is linked to the xxtest output directory for that protocol.

Using the xxtest login, tests may be run and their results examined through the Man-Machine-Interface and the Report Generator. The xxrslt login only allows the user to look at test results. Clients are restricted to viewing their test results only.

SECTION 5 - INSTALLING THE DCA UPPER LEVEL PROTOCOL TEST SYSTEM

Follow these steps to install the DCA Upper Level Protocol (ULP) Test System. The bold text marks commands the operator enters.

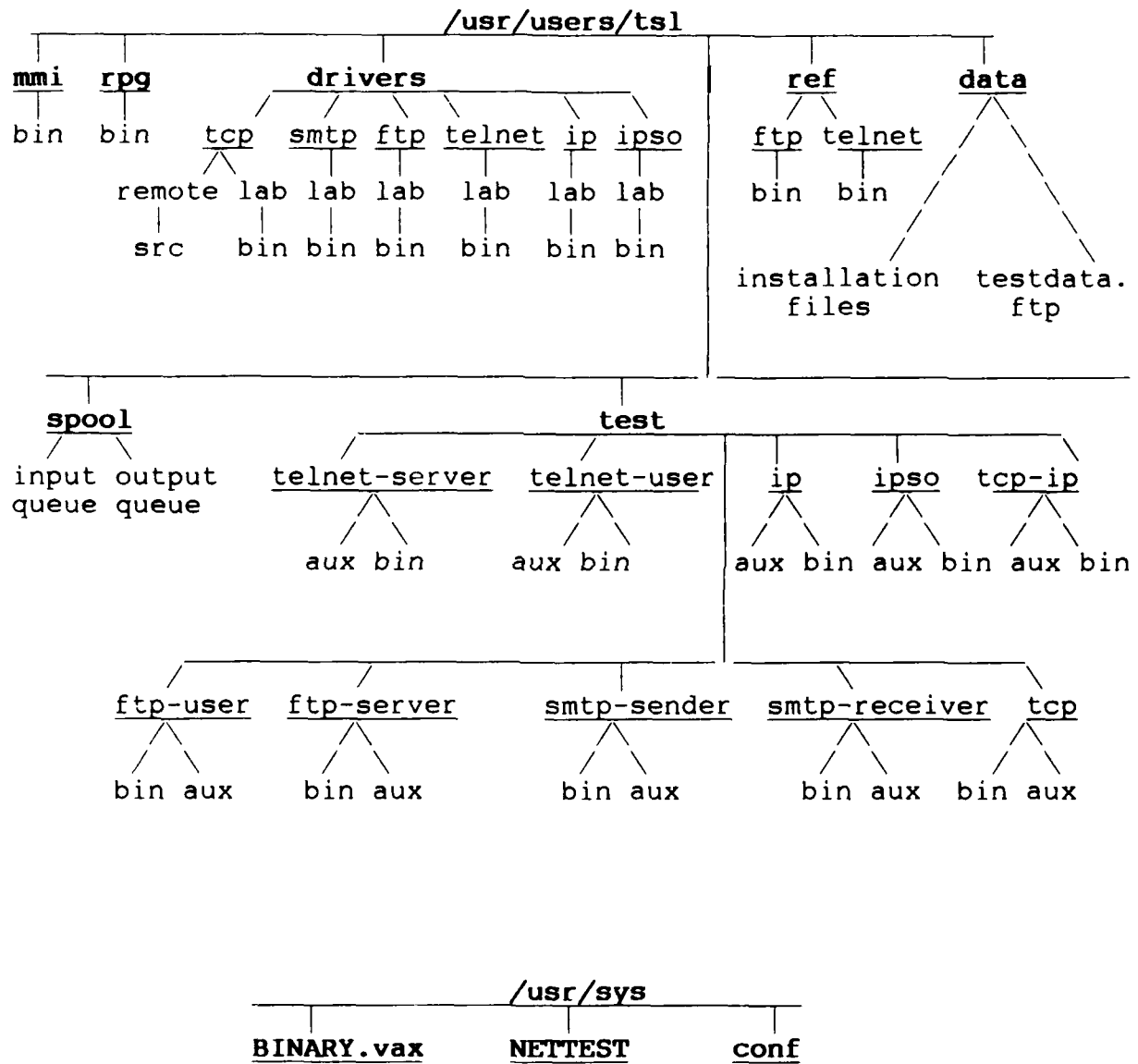
1. Back up your system.
2. Load the DCA ULP Test System release tape. (Figure 5-1 shows the contents of the release tape.)
3. Login as the root.
4. **cd /** (change to the root directory.)
5. **cp vmunix vmunix.STD** (copy your current kernel to a backup.)
6. **tar xv** (Extract the DCA ULP Test System files.)
7. **cd /usr/sys/conf** (Steps 8 - 10 will be done in this directory).
8. Copy your host's current configuration file to file NETTEST.
9. Edit file NETTEST: Change the value of keyword "ident" to NETTEST. (For example: ident NETTEST).
10. **/etc/config NETTEST** (Build the make file for the DCA ULP kernel.)
11. **cd /usr/sys/NETTEST** (This is the directory where the DCA ULP kernel will be built.)
12. **make depend** (Run make to add dependencies to the makefile created in step 10.)

13. **make** (Build the DCA ULP kernel.)
14. **cp vmunix /vmunix** (Replace the standard system kernel with the DCA ULP kernel. It will not start executing until the the system has been rebooted.)
15. Edit the file `/etc/services`. Add the file `/usr/users/tsl/data/installation_files/add_to_services` to `/etc/services`.
16. **shutdown -r +1** (Reboot the system to run the DCA ULP kernel.)

If the system reboots with no problems continue, otherwise redo the steps above until the system boots correctly.

17. Login as root.
18. Add new users necessary for the DCA ULP test scenarios to run correctly. These new users are test, test2, and test3.
19. Copy `/usr/users/tsl/data/testdata.ftp/*` to the new user directory test.
20. Add new client users to permit testing. (See Section 6.)

Figure 5-1 **PROTOCOL TEST SYSTEM**
RELEASE TAPE



SECTION 6 - SETTING UP CLIENT TEST ENVIRONMENT

Follow these steps to build the test environment required for client testing.

1. Assign a 2 character alphanumeric id to the client.
2. Prefix the client id to the string "test" and the string "rslt" to form two client login name. For example given a client id of xx, the login names would be xxtest and xxrslt.
3. Login as root.
4. Add client logins to `/etc/passwd` using `vipw`.
Assign the login names to the same group number. An example of the two login names in the password file would be:
 xxtest::100:100:Test Client Xray:/usr/users/xxtest:/bin/csh
 xxrslt::101:100:Test Client Xray:/usr/users/xxrslt:/bin/csh
5. Add client group id to file `/etc/group`. Every group name must begin with the prefix `iu`. For example the group name of xxtest and xxrslt might be `iuxxtest`.
6. Login as xxtest and assign a password to this login name using `passwd`.
7. Login as xxrslt and assign a password to this login name using `passwd`.
8. Login as root.
9. Change directories to `/usr/users/tsl`.
10. Run the shell script `Make-bld-iut`. You will be prompted for the 2 character client id and the group id. (This shell file will build the directories necessary for client testing.)

APPENDIX A - TEST REFERENCE UNIX FILES

The following files have been added or modified to create the DCA ULP Test System kernel from the ULTRIX kernel. They are listed as they appear in the configuration file.

nettest/in_proto.c	optional inet Binary
nettest/init_sysent.c	optional inet Binary
nettest/ip_icmp.c	optional inet Binary
nettest/ip_input.c	optional inet Binary
nettest/ip_output.c	optional inet Binary
nettest/ip_test.c	optional inet Binary
nettest/ip_test2.c	optional inet Binary
nettest/raw_cb.c	optional inet Binary
nettest/raw_ip.c	optional inet Binary
nettest/raw_test.c	optional inet Binary
nettest/raw_report.c	optional inet Binary
nettest/rawip_output.c	optional inet Binary
nettest/sys_socket.c	optional inet Binary
nettest/tcp_input.c	optional inet Binary
nettest/tcp_output.c	optional inet Binary
nettest/tcp_report.c	optional inet Binary
nettest/tcp_subr.c	optional inet Binary
nettest/tcp_test.c	optional inet Binary
nettest/tcp_timer.c	optional inet Binary
nettest/tcp_usrreq.c	optional inet Binary
nettest/uipc_socket.c	optional inet Binary
nettest/uipc_socket2.c	optional inet Binary
nettest/uipc_syscalls.c	optional inet Binary